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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/942,461	08/29/2001	Sadaaki Sakamoto	P/1071-1438	8084

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EXAMINER

MAYES, MELVIN C

ART UNIT	PAPER NUMBER
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1734

DATE MAILED: 03/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/942,461

Applicant(s)

SAKAMOTO, SADA AKI

Examiner

Melvin Curtis Mayes

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-12 and 15-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-12 and 15-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 112

(1)

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

(2)

Claims 7 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 7 and 11 claim that borosilicate glass is “forsterite, akermanite or diopside.” However, forsterite is Mg_2SiO_4 , akermanite is $\text{CaMgSi}_2\text{O}_7$ and diopside is $\text{CaMg}(\text{SiO}_3)_2$. These are not borosilicate glasses (also see specification, pg. 8, line 12). Nor is it clear how forsterite, akermanite or diopside are related to borosilicate glass as claimed in Claims 6 and 10 from which the claims depend. According to Table 1 of the specification, forsterite, akermanite or diopside are the precipitated crystalline substance from a Si-Mg-Ca-O-based glass powder (which is not a borosilicate glass). Does Applicant mean that a precipitated crystalline substance is forsterite, akermanite or diopside, as set forth in the specification? For purposes of examination, the claims are interpreted to mean that the crystalline substance that is precipitated during sintering includes forsterite, akermanite or diopside, since the claims depend from borosilicate glass being the glass in the green base layers.

Claim Rejections - 35 USC § 103

(3)

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

(4)

Claims 1-6, 8-10, 12 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuta et al. 5,456,778 in view of Nishigaki et al. 4,726,921.

Fukuta et al. disclose a method of making a ceramic circuit substrate comprising: forming a green laminate of ceramic greensheets comprised of a mixed powder of glass and alumina with binder and having internal layer circuits printed thereon; providing unsintered ceramic greensheets of alumina, which do not sinter at the sintering temperature of the ceramic greensheets, on the surfaces of the green laminate; sintering at 800-1000°C; and removing the unsintered greensheets. The glass of the ceramic greensheets can be glass of the CaO-Al₂O₃-SiO₂-B₂O₃ system, glass of the PbO-SiO₂-B₂O₃ system or glass of the MgO-Al₂O₃-SiO₂-B₂O₃ system (col. 5, line 1 – col. 6, line 60). Fukuta et al. do not disclose sintering at a rate of more than 20°C/minute.

Nishigaki et al. teach that in the manufacture of a low temperature fired ceramic useful in electronic components, greensheets comprised of glass and alumina and firable at 800-1000°C can be fired with considerably reduced firing time by continuously firing the greensheets in an

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air furnace by rapidly heating at a heating rate of 10-200°C/min, preferably 20-200°C/min. Air is fed into the binder-removing zone of the furnace so that the air feed has a particular ratio. The low temperature fired ceramic composition are retained in a porous state up to the firing temperatures of 730-850°C without causing softening and shrinking of the glass phase and thereby binder is removed without causing cracks or incorporating carbon, and since the ceramics are rapidly shrunk and sintered during firing, a dense ceramic substrate can be readily obtained in a shortened period. Further, at firing, deformation of fine conductor pattern is minimized. The rapid sintering ability is due to the partial crystallization of the low temperature ceramic composition. The low temperature firable greensheets comprise alumina and a glass, the glass being a $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$ system non-crystallized glass which is partially crystallized in the course of the firing step and precipitates crystals of anorthite or anorthite-calcium silicate (col. 5, line 30 – col. 8, line 31).

It would have been obvious to one of ordinary skill in the art to have modified the method of Fukuta et al. for making a ceramic circuit substrate by sintering the green laminate of glass and alumina at a rate in the range of 20-200°C/min, as taught by Nishigaki et al., as preferable to considerably reduce the firing time of the low temperature composition of glass and alumina, thus obtaining a dense ceramic substrate in a shortened period and with minimized deformation of fine conductor pattern. By sintering at a rate of 20-200°C/min, as taught by Nishigaki et al. as preferable for rapid firing of a composition of alumina and glass which partially crystallizes during firing, sintering is performed in which the ceramic powder is densified while the glass component is fluidized and the rate is such that the glass component

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precipitates a crystalline substance after the ceramic powder is densified, as claimed in Claims 1 and 15.

By providing the glass of the greensheets as a glass of the $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$ system, $\text{PbO-SiO}_2\text{-B}_2\text{O}_3$ or $\text{MgO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$ system, the glass is a borosilicate glass, as claimed in Claims 6 and 10.

(5)

Claims 3 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 2 and 16 above, and further in view of Hakotani et al. 5,370,759.

Hakotani et al. teach that multilayered ceramic substrates are for mounting and interconnecting electronic components (col. 1, lines 7-10).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by mounting an electronic component on the multilayer ceramic substrate after sintering, as Hakotani et al. teach that multilayered ceramic substrates are for mounting and interconnecting electronic components.

(6)

Claims 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over the references as applied to claims 6 and 10 above, and further in view of Nishigaki et al. 4,621,066 and Martin 4,853,349.

Nishigaki et al. teach that glass of the $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$ system contain up to 10% impurities.

Nishigaki et al. '066 teach that the impurities in the glass of low temperature fired ceramics of glass and alumina include oxides such as MgO (col. 4, lines 63-65).

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Martin teaches that thermally-crystallizable glass compositions of $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2$ that contain MgO crystallize into gehlenite-akermanite-anorthite as the predominant crystalline phases (col. 3, lines 38-55, col. 4, lines 4-19).

It would have been obvious to one of ordinary skill in the art to have modified the method of the references as combined by providing the glass as one that, in addition to anorthite, also crystallizes into akermanite, as Nishigaki et al. teach that an impurity in glass of the $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2\text{-B}_2\text{O}_3$ system can be MgO, Nishigaki et al. '066 teach that the impurities in the glass of low temperature fired ceramics of glass and alumina include oxides such as MgO and Martin teaches that thermally-crystallizable glass compositions of $\text{CaO-Al}_2\text{O}_3\text{-SiO}_2$ that contain MgO crystallize into gehlenite-akermanite-anorthite as the predominant crystalline phases. By including up to 10% of MgO as an impurity in the glass, akermanite is precipitated in addition to anorthite during sintering, as suggested by Martin.

Conclusion

(7)

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The references disclose methods of producing multilayer substrates using shrinkage restricting sheets and glass ceramic compositions including forsterite or diopside.

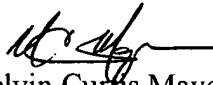
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(8)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Melvin Curtis Mayes whose telephone number is 703-308-1977. The examiner can normally be reached on Mon-Fri 7:30 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on 703-308-3853. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


Melvin Curtis Mayes
Primary Examiner
Art Unit 1734

MCM
February 24, 2003